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## **Information Logistics**

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### **Abstract**

Logistics can be defined as the process of strategically managing the acquisition, movement and storage of materials, parts and finished inventory (and the related information flows) through the organization and its marketing channels in a cost effective manner. It is concerned with delivering the right product, to the right customer, in the right place and at the right time. The logistics function is composed of inventory management, facilities management, communications unitization, transportation, materials management and production scheduling.

The relationship between logistics and information systems is clear. Systems such as Electronic Data Interchange (EDI), Point of Sale (POS) systems, and Just in Time (JIT) inventory management systems are important elements in the management of product development and delivery. With improved access to market demand figures, logisticians can decrease inventory sizes and better service customer demand. However, without accurate, timely information, little, if any, of this would be feasible in today's global markets.

Information systems specialists can learn from logisticians. In a manner similar to logistics management, *information logistics* is concerned with the delivery of the right data, to the right customer, at the right time. As such, information systems are integral components of the information logistics system charged with providing customers with accurate, timely, cost-effective and useful information.

Information logistics is a management style and composed of elements similar to those associated with the traditional logistics activity: inventory management (data resource management), facilities management (distributed, centralized and decentralized information systems), communications (participative design and joint application development methodologies), unitization (input/output system design, i.e., packaging or formatting of the information), transportation (voice, data, image and video communication systems), materials management (data acquisition, e.g., EDI, POS, external databases, data entry) and production scheduling (job, staff and project scheduling).

## **Information Logistics:**

### **A Production-Line Approach to Information Services**

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## **INTRODUCTION**

Information has long been considered to be a service good, and information systems (IS) personnel perceived as providers of services that are essential not just for the daily operations but for long-term strategic needs. Whether for short-term or long-term needs, information is constantly being used to make decisions for financial, marketing, R&D and manufacturing needs. Information systems are thought of as service weapons that can be wielded to gain market share, excess profits, and thus improve profitability for the company that produces the most innovative information systems.

IS is no panacea. It is a tool for producing a resource-- information--that can be used to leverage or replace existing resources. By focusing upon the delivery of relevant, accurate and valid information, IS personnel will have engendered substantial strategic impact upon the growth of their firms. In other words, IS personnel should concentrate upon treating information, though an invaluable resource, as a product, deserving of quality-oriented techniques designed for manufactured products.

## **THE INFORMATION PRODUCT**

Why has information been considered a service good? It might be instructive to consider the characteristics of services vis-a-vis products, and then consider where information might fall between the two categories.

Though it is true that all goods, when marketed, possess both service and product components, the focus here is upon the very nature of the good itself, and not its marketing. Thus a research report produced by a consultant is not the service being acquired by the customer; it is the analysis, synthesis and conclusion generated by the consultant while using that person's skills that is being purchased.

A key criterion in distinguishing a service good from a product good, is tangibility which forms the basis for other criteria such as perishability and simultaneity of production and consumption. However it can be demonstrated that information, though intangible, does not necessarily fulfill the remaining criteria for service goods.

### Perishability

Service offerings are generally considered as being perishable in that service vendors cannot stockpile services that can be used to smooth demand fluctuations for their services. However, this criterion does not hold true for information. Information can be preserved in databases for many years and retrieved for use without the loss of any accuracy; though the electronic media may deteriorate, the information can be transferred to newer, fresher media. Thus, information need never perish. In this respect, information is similar to products. However, unlike material goods, information can be compressed or condensed and still retain its accuracy.

The capability of maintaining information from the moment of storage until usage enables the consumer to possess confidence in the quality of the stored information. Since the usefulness of information is dependent upon the consumer's perception, only the user can be the judge of the value of information stored in computer databases. Consequently, to the consumer, information can appreciate or depreciate in value. This characteristic is

unique to information because products typically depreciate with the passage of time, and services depreciate upon consumption.

### Simultaneity of production and consumption

This criterion is linked to the foregoing concept in that the perishability of services necessitates that it be produced only when consumed. Though this criterion holds true for many services, information can be collected, stored, processed, and distributed even before there is a need for it. In fact, information can be consumed over and over.

### Ownership

Information poses a unique problem regarding ownership. Like products, the ownership of information, can be established. On the other hand, information can be shared infinitely. Information that is shared does not result in loss ownership; in fact, every recipient of the information can legally or otherwise put it to use. There is no division or loss of ownership when information is transmitted. Unlike products where ownership changes hands or services where the service potential remains with the owner. Thus we postulate that information can be perceived as a hybrid product/service. With these qualities, information is far more amenable to the concept of service industrialization.

## INFORMATION LOGISTICS

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place and at the right time. The logistics function is composed of inventory management, facilities management, communications, unitization, transportation, materials management and production scheduling.

The roots of logistics management are deep. However, the renewed interest in the area began in the early 1970s. Deregulation and improved information systems served to create opportunities and threats in markets that once competed in geographically small areas. The ability to penetrate new markets, at home and abroad, pointed up problems in existing logistics systems. When energy prices and interest rates began to climb, the costs of inventory and transportation became significant portions of the organization's bottom line. Logistics managers were called upon to manage more than trucks and inventories; they needed to manage the entire process. Having the right information to do this was essential.

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There is a strong association between the rise of the IS consultancy and information logistics. As information system users become more sophisticated and as IS outsourcers become more adept at providing information services to clients, the traditional IS department becomes more an information technology consultant than a supplier of information system products. However, the management of the information inventory and delivery systems will remain a service provided by the IS consultant. Information logistics is the foundation of this concept.

## INDUSTRIALIZATION OF INFORMATION SERVICES

Leavitt's purpose in introducing the concept of service industrialization was to improve the efficiency and consistency of delivered offerings of service industries. He points out that traditional manufacturing industries have been able to introduce mass-production techniques that allowed for the cost-efficient manufacturing of goods at a consistent level of quality. The productivity increases in industrial processes result from the transformation of the manufacturing methods, or the manufacturing tasks themselves.

On the other hand, productivity increases in the service industries fall upon the shoulders of the performers of those desired services. Leavitt maintains that service companies "fail to think and act as do manufacturing companies concerned with the efficient, low-cost production of consumer-satisfying products." His suggestion is that the same concepts that have proved so successful for manufacturing industries (standardization and automation) could be introduced to the service industries.

Leavitt's ideas are well suited to the field of information systems. Such innovations include the use of computer-aided software engineering (CASE) for software development and maintenance, and the introduction of object-oriented programming (OOP) for reusable software modules.

In the past, the production of computer software has been performed using pencil and paper. The inefficiency of the traditional methods of software development has been compared to using a stone knife to build jet fighter. It is no wonder that a recent survey of IS projects reveal that 79% are behind schedule, 19% are on schedule, and a minuscule 2% are ahead of schedule. The average effort is 235 person-months, and each project is estimated to be useful for only 20.7 months. Furthermore, up to 25% of projects involving more than 60,000 lines of code are cancelled before completion.

Such is the waste of traditional software development methods that treat information as a service, and the development of information systems as a craft. How can top management rely on an unsound approach to information systems development devoting millions of dollars to projects that would be unthinkable on the factory floor?

CASE tools and structured systems development methodologies, that are being used to automate the software process, are functionally equivalent to the automated equipment used in the manufacture of products. With the use of these tools and other related

innovations to automate the production and maintenance of software, companies can methodically approach the strategic potential of information by quickly creating quality-oriented products.

The object-oriented approach allows software and information to be used and reused in the construction of new software. Program code for routine tasks has traditionally been rewritten each time it is needed. This creates labor inefficiencies. The idea of "plug-and-play" software components allows software developers to use existing software components to create new information systems and to innovate by using previously created software components.

The use of CASE tools for standardized software development and maintenance, and the use of OOP techniques for the creation and reuse of software components is partially the consequence of the production-line approach to information systems development. But how will the production-line approach to information be of use to management? Will companies gain any new insights to using information systems for strategic advantage? How will information as a product be put to better use than information as a service?

Treating information as a product during the acquisition, storage, processing and distribution stages of its value chain renders it amenable to a manufacturing approach that would provide for its improved production efficiency, quality and responsiveness. Thus, it would be instructive to examine the manufacturing process as applied to the production of tangible items. One manufacturing concept that has proven highly successful and effective in increasing manufacturers' responsiveness and profits is flexible manufacturing. Flexible manufacturing is based upon the integration of computer-aided design and computer-aided manufacturing (CAD/CAM), sometimes collectively termed computer integrated manufacturing (CIM), that provides for the speedy design and manufacture of small job

runs.

A flexible manufacturing approach to the development and implementation of the software components of information systems will allow for the development of more responsive information products. Merrill Lynch would not have held such an overwhelming share of the cash-management account marketplace but for the lack of quick response by its competitors. If the information system departments of competing firms had been able to develop similar financial products very quickly, Merrill Lynch would not have been acclaimed a leader in the strategic use of information systems.

By applying the flexible manufacturing approach in generating information products, information systems personnel would be able to enhance their firm's abilities to respond to external competitive pressures. Just as speed is crucial in responding to competition, information is crucial in attaining responsiveness.

## A PRODUCTION-SERVICE MODEL OF INFORMATION SERVICES

We postulate that it is important to divorce information from the production process itself--the information system--because the strategic value arises from the information, and not the information system. Only by doing this can management focus upon the value-added impact of information, and not the technology used to produce it.

The user has several options that are available for the processing and presentation of the data, and may be indifferent as to how it is delivered. Just as the consumer of virtually any manufactured good does not know or care much about the production intricacies associated with that product, the consumer of information is usually not concerned with its production by the information system. As long as the information is

delivered in an accurate and timely fashion, organizations have shown that they are not concerned with who is actually involved as long as proper controls are maintained. Companies such as Enron and Kodak have demonstrated that data processing activities can be managed by third party "outsourcers" and not disrupt information flow. (It is not clear, however, what the long-term, strategic impact of these agreements will be.)

Porter uses the idea of a value chain to present the notion that, as raw materials move through the organization's transformation process, they gain value. Different elements of the organization support or add value to these products. Porter suggests the information systems role is one of these support functions. However, it is useful to apply the value chain to the information systems function itself, as can be seen in Exhibit 1.

This value chain is partitioned into information production and information services. *Information production* is concerned with the acquisition, storage, processing and distribution of information, while *information services* provides marketing and consulting functions.

The *information production* function roughly corresponds with what is traditionally thought of as a data processing operation. **Inbound logistics** contains those actions that acquire data from sources external to information systems. These "raw materials" might come from Electronic Data Interchange documents, Electronic Funds Transfers, Point-of-Sale systems or more traditional data entry systems. This data is collected and stored in a data inventory for processing.

The **operations function** transforms the data inventory into usable forms. The systems development life cycle is a structured procedure that creates the transformation process. Object oriented programming is a new technique that treats pieces of programs and data as component parts that can be used and reused in new systems. This flexible manufacturing approach to information production has the potential of greatly changing the

way systems are constructed. CASE tools are akin to robotics and factory automation in that they can be used to automate the production of the information system and the information.

**Outbound logistics** is associated with the delivery of the information to the consumer. Information communication systems can deliver voice, data, image or video information to and from the consumer. The outbound logistics function is the focal management point in a distributed data processing environment where the multiple, distributed data inventory warehouses pose logistical problems. A variety of connectivity, distributed database and cooperative processing tools are emerging to address this situation.

The *information production* function can be managed as a flexible job-shop manufacturing operation. As such, all systems are developed essentially alike and are constructed of the same basic components. Using reusable objects and CASE tools, information system products can be quickly developed and delivered. The application portfolio would consist not of programs, but of programming objects that can be manipulated by CASE tools. A production line of object specialists can install various components of the overall system under the supervision of a line manager--the traditional systems analyst.

This internal view of information management is contrasted with the service-oriented external view held by the rest of the organization. *Information services* provides all of the consumer relations services normally found in other functional areas. This area is charged with the duty of identifying and satisfying consumer demand for information. **Information services marketing** embodies the information consultancy function. This function acts as an information technology consulting and planning team for the organization. Because information consumers have a number of sources for information processing, this marketing

function is concerned with consumer relations and information services marketing. It may seem odd to market a service whose demand is far greater than its supply. However, as the numbers of departmental systems grow and as users become more sophisticated in their own data processing abilities, the demand for information services will change.

**Information system services** aids users in the consumption of information. The information center and help desk/hotline functions will not only enable consumers to better avail themselves of the information, but will also be a key component of the consumer relations staff possibly affecting future demand for services.

By dividing the information systems function into a product component and a services component, the correct emphasis may be placed on each. To the consumer, IS is viewed as a service organization ready to fill an information need. Internally, it is viewed as a flexible manufacturer of information transformation tools, a data warehouser and a common carrier of information goods, with emphasis on cost control, application object portfolio management and quality control (just-in-time data inventory practices and Jidoka-quality at the source--data acquisition and systems design). In so doing, there are several implications for the CIO and other chief executives.

## ISSUES FOR THE CIO

*Users have other sources for information support.* Managers of information systems are increasingly aware of the data processing capabilities that are accumulating in the users' hands. Another trend facing these managers is that of outsourcing of the data processing function. Outsourcing occurs when an outside party contracts to provide some or all of an organization's information processing needs for a period of time. Firms such as Andersen Consulting, EDS and IBM are taking over data center operations, systems development

projects and IS strategic planning. Firms that have chosen to outsource primarily do so to cut costs.

In some cases, this represents a threat to inhouse staff. An information production approach that focuses on cost control and consistently high quality products can not only make the operations function run more smoothly, but can serve to improve consumer relations and overall IS productivity.

*The information systems function is an information transporter, transformer and warehouser.* It is essential for the IS staff to realize that systems and data with which they work represent valuable corporate resources. In the past, this has been a good idea that has been difficult to operationalize. A database can be considered to be a data inventory stored in an information warehouse; the information communication system can be a common carrier; systems development tools are like flexible factory automation cells.

Adopting this attitude toward information systems would be helpful in creating a manufacturing atmosphere for the production of information systems. Managers can apply production and logistics techniques to the function and can concentrate on efficiencies and portfolio management.

Building the object portfolio will take time. As new projects are evaluated for consideration, the constituent objects, new and existing, should be evaluated. The new objects should be weighed for future use and remarketing. As systems grow, mature and decline unless they are re-engineered and begin to mature again. The object oriented approach would make this re-engineering effort more effective.

*The information systems function can be run as a business unit.* The information systems function can be thought of as a business unit just as any other area. This is not new, but costs can be better controlled. The information production concept allows

managers to concentrate, internally, on cost control, thoughtful resource allocation and quality assurance. The information service approach gives managers the opportunity to focus on "profit" or "sales". This balance is critical to the overall success of the information production services approach.

*Emphasize functional marketing and product delivery.* Support of functional business areas will allow the IS group to more successfully market information technologies. Systems analyst sales representatives should be assigned to specific functional areas in an attempt to better understand the decision making environment in which their customers exist. By acting as information systems consultants, these individuals will be able to direct and enhance the use of information technologies within those areas by looking for opportunities to diversify the application portfolio in support of the functional business unit's goals.

The concentration on product delivery will emphasize the desire on the part of the IS business unit of the importance of customer satisfaction and product quality. Many organizations already have systems analyst-business specialists that become knowledgeable in the functional area in which they are assigned. These individuals, however, rarely have responsibility for the ultimate satisfaction of the information consumers, but act more like consultants to the IS staff for correct system design.

## ISSUES FOR OTHER CHIEF EXECUTIVES

*Choose appropriate IS purchase strategy.* There are a variety of sources of information technologies. Business units can choose the purchase strategy that exhibits the amount of control desired. For example, some managers want ultimate control over the processing of the information on which they base their decisions. As such, these managers elect to establish an information systems staff within the functional area. Other managers wish to

relinquish some of their control and select a more centralized information processing alternative. Still others choose to outsource to satisfy their information needs. The amount of control desired is a function of the individual's management style, the relative costs associated with the project, organizational imperatives and personalities, and the level of technological expertise required to manage the task.

*The information systems function is a seller, a marketer, a provider--the information is a corporate resource.* The information technology staff is internally operated as a manufacturing concern that produces information transformation and delivery products. The information that passes through those systems is a corporate resource that can be manipulated in a variety of ways. As a manufacturer, IS will focus on product alignment and development strategies that will serve to lower overall costs to the organization. It is necessary to separate the information from the information system when selecting an information technology provider.

*IS will evaluate projects as to their fit with the portfolio and production line.* As with all manufacturing operations, the production line, once configured, can produce only certain goods. It must be retooled before it can produce different products. Even in the flexible manufacturing environment, there is a setup cost associated with new products. The IS staff will view all new projects as potential alterations to its production facilities and will encourage solutions that use existing portfolio products.

*Competitive uses of information technologies are championed by the functional areas.* As can be seen in many case studies, the IS function typically does not suggest competitive applications of information technology, but instead, offers technological solutions to functional problems. This implies that IS and non-IS management teams must understand each other's concerns and strengths. The IS consultancy will scan the technological

environment and, when discussing functional problems and desires, present potential solutions. Without this interaction, however, the functional manager will have to scan the IS environment as well as his or her own environment to successfully apply information technology. Also, if IS suggests solutions to functional concerns, the wrong problem may be solved or resources needlessly spent.

## SUMMARY

The creation of information products has traditionally been viewed as an art or craft, not amenable to rapid, mass production. The service approach to this area has caused significant backlogs and cost overruns. For decades, the limitations of the information technology itself prohibited the efficient production of information and information systems. However, with tools such as computer aided software engineering and object oriented programming, many of the advantages of flexible manufacturing found on the factory floor can be transferred to the software shop. The result should be the rapid creation of information delivery systems that respond to the needs of the information consumers. Also, by using components from previously manufactured systems that have been time tested and intelligent object management practices, the quality of these systems should be at least as high as their constituent components. By separating information from the information system development process and treating systems as products can help organizations more effectively combat the use of other information technologies as competitive weapons, or can protect advantages previously gained by these systems.

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INFORMATION PRODUCTION			INFORMATION SERVICES	
In Bound Logistics	Operations	Out Bound Logistics	Sales & Marketing	System Services
Data Entry Data Capture (Electronic Data, Interchange, Point-of-Sale, Electronic Funds Transfers, etc.)	Systems Development Life Cycle Tools: Object Oriented Programming and Databases, Computer Aided Software Engineering, etc.	Information Communications (Voice, Data, Video, Image, etc.)	IS Consultancy Marketing of IS Information Consumer Relations	Information Centers Help Desks/ Hot Lines Maintenance Training

Exhibit 1: Production/Service Model for Information Systems

## A Definition of Traditional Logistics

The process of strategically managing the acquisition, movement and storage of materials, parts and finished inventory (and the related information flows) through the organization and its marketing channel in such a way that current and future profitability is maximized through the cost-effective fulfillment of orders (Gattorna, 1988)

# Traditional Logistic Elements

Transportation

Storage

Quantity to be distributed to  
consumers

Technological content of the  
product

Product reliability

Replacement time for additional  
spare or repair parts

Test and Support Equipment

Documentation

Personnel and Training

Spares and Repair Parts

# Traditional Logistic Elements

## Facilities

Supplier storage

Incoming materials storage

Finished goods storage

Production equipment

    maintenance facilities

Maintenance and repair

    facilities after transfer of  
    ownership

# A Definition of Information Logistics

Information logistics is the process of strategically managing the acquisition, movement and storage of information. It is the delivery of the right information to the right person at the right time in the right format.

# Information Logistics

Information Logistics is a  
Process

Top Management Support is  
Critical

It is the Acquisition,  
Movement and Storage of  
Information

# Information Logistics

Information Logistics is the  
delivery of:

The Right Information

The Right Person

The Right Time

The Right Format

# Information Logistics Elements

Transportation - Technical  
and Organizational  
Communication Structures

Storage - Database Systems

Spare and Repair Parts -  
Fault Tolerant Systems and  
Structures

Personnel and Training

# Information Logistics Elements

Documentation -  
Organizational and  
Technical

Test and Support Equipment -  
Diagnostic Systems

Facilities - Data Collection  
and Presentation Systems

# The Nature of Information

Information is Infinitely  
Sharable

Ownership is a Function of  
Evaluation

Its Value is not Fixed

Information Need Never Perish

## A Production/Service Model of Information Logistics

	INFORMATION PRODUCTION			INFORMATION SERVICES	
	In Bound Logistics	Operations	Out Bound Logistics	Sales & Marketing	System Services
I T	Data Entry	Systems	Information	IS	Information
n e E	Data Capture	Development	Communications	Consultancy	Centers
f c x	(Electronic Data,	Life Cycle	(Voice, Data,	Marketing	Help Desks/
o h a	Interchange,	Tools: Object	Video, Image,	of IS	Hot Lines
r n m	Point-of-Sale,	Oriented	etc.)	Information	Maintenance
m o p	Electronic Funds	Programming and		Consumer	Training
a l l	Transfers, etc.)	Databases, Computer		Relations	
t o e		Aided Software			
i g s		Engineering, etc.			
o y					
n					